View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by International Journal of Innovative Technology and Research (IJITR)

(IJITR) INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND RESEARCH
Volume No.6, Issue No.4, June - July 2018, 8421-8427.

Power Allocation In Downlink Of A Cellular OFDMA Networks

KONIDENA. PRAVEENA
Pursuing M.Tech (VLSI&ESD) from SKR College of Engineering & Technology, Manubolu, SPSR Nellore.AP.

V.NANUKU NAIK
M. Tech, Assistant Professor in Deportment of ECE, SKR College of Engineering & Technology, Manubolu, SPSR Nellore.AP.

Abstract: **This paper tends to the issue of vitality productive asset allotment in the downlink of a cell OFDMA framework. Three meanings of the vitality proficiency are considered for framework configuration, representing both the transmitted and the circuit control. Client booking and power distribution are enhanced over a group of composed construct stations with an imperative in light of the most extreme transmit control (either per subcarrier or per base station). The asymptotic clamor restricted administration is talked about as an exceptional case. Results demonstrate that the amplification of the vitality proficiency is roughly comparable to the expansion of the ghastly productivity for little estimations of the most extreme transmit control, while there is an extensive variety of estimations of the greatest transmit control for which a direct lessening of the information rate gives a huge sparing regarding dispersed vitality. Likewise, the execution hole among the considered asset designation techniques decreases as the out-of-group impedance increments.**

Keywords : **Green Correspondences; Vitality Productivity; Asset Designation; Planning; Control; Cell Arrange; Downlink; Base Station Coordination; OFDMA;**

I. INTRODUCTION

Symmetrical Frequency Division Multiple Access (OFDMA) is the main multiaccess innovation in current remote systems, for the most part because of its capacity to battle the impacts of multipath blurring [1]. So as to build the limit of OFDMA-based systems, consideration has been given to the deduction of versatile asset assignment plans, which consider factors, for example, movement stack, channel condition, and administration quality. Specifically, base station (BS) coordination has developed as a compelling methodology to alleviate downlink co-channel impedance. Accepting that the information images are known just by the serving BS, a few papers have demonstrated that joint booking and power control among an arrangement of composed BSs in light of channel quality estimations can extraordinarily enhance the system aggregate rate [2]– [10].

Then again, natural and financial concerns require to likewise represent the vitality proficiency of a datanetwork [11]. This point has as of late increased enormous energy and various uncommon issues, meetings, and research ventures have been committed to green correspondences over the most recent couple of years: see, for example, [12]– [14], as a hint of a greater challenge. Vitality mindful outline and arranging is roused by the factthat remote systems are capable of a division somewhere in the range of 0.2 and 0.4 percent of aggregate carbon dioxide outflows [15], and this esteem is relied upon to become due to the ever-increasingnumber of supporters. To be sure, vitality proficiency will be a keyissue likewise in future fifth-age cell systems [16]. The greatest endeavors to build the vitality effectiveness of a remote system are focused on the entrance arrange, since it devours the biggest segment of vitality [17]. Here, potential arrangements incorporate vitality sparing calculations for turning on and off BSs that are either latent or softly loaded[18], vitality productive equipment arrangements [19], and energyefficient asset assignment calculations. Concentrating on this last issue, in [20]– [24], the vitality effectiveness is characterized as the proportion between the throughput and the transmit control, and the transmit control level boosting the measure of information bits effectively conveyed to the collector for every vitality unit is inferred. A more broad meaning of the vitality effectiveness is acquired when the circuit control disseminated to work the gadgets is incorporated as an added substance steady at the denominator. This approach has been considered in [25], where control for coordinate succession code division numerous entrance multiuser systems is handled, in [26], where vitality effective correspondence in a solitary client various information different yield (MIMO) framework is examined, and in [27], where control in hand-off helped remote systems is considered. In [28], [29], a few models for the circuit control utilization in remote systems are expounded. In [30], the tradeoff between energyandspectral-proficient transmission in multicarrier frameworks is researched. The papers [31], [32] center around the uplink of an OFDMA framework; the previous thinks about a solitary cell framework and infers low-many-sided quality planning and power control procedures, while the last uses a diversion theoretic way to deal with determine decentralized asset designation

 @ 2013-2018 http://www.ijitr.com All rights Reserved.

techniques for a multicell OFDMA framework. With respect to the downlink of an OFDMA framework, late commitments incorporate [33], [34]. The paper [33] utilizes fragmentary programming to infer precoding coefficients, transmit power, and client subcarrier relationship for vitality productivity expansion in a multi-cell framework. The paper [34], rather, explores the tradeoff between vitality productivity and number of transmit recieving wires.

This paper considers the downlink of a multi-cell OFDMA framework, where various BSs shape a bunch, share data on channel quality estimations, and work together with a specific end goal to perform vitality effective client booking and power control on a similar radio spectrum1. The commitments of this work are outlined as takes after.

• Three figures of legitimacy identified with the vitality effectiveness of the planned BSs are considered, to be specific, the proportion between the whole rate and the power utilization, which is alluded to as worldwide vitality productivity (GEE), the weighted entirety of the vitality efficiencies accomplished on every asset opening (Sum-EE), and the exponentially-weighted result of the vitality efficiencies accomplished on every asset space (Prod-EE). These figures of legitimacy catch distinctive highlights of the thought about correspondence framework, which we outline and talk about. Past related works have for the most part centered around the amplification of GEE, however for various framework settings. To the best of our insight, the work which considers the situation most like our own is [33]; be that as it may, while [33] accept that clients are related to all BSs in the group, a setup typically alluded to as virtual (or system) MIMO, we consider a situation wherein every client is related to just a single BS. As to Sum-EE and Prod-EE, they have been considered in non-agreeable recreations [32], [35], however not with regards to facilitated cell systems.

• We infer novel methods went for expanding the above figures of legitimacy with an imperative on the most extreme transmit control (either per subcarrier or per base station): this is the real commitment of this work. Hmm is streamlined by settling a progression of sunken curved fragmentary relaxations, while for Prod-EE a progression of concaverelaxations is considered. In the two cases, the proposed techniques monotonically merge to an answer which in any event fulfills the principal arrange optimality states of the first issue. As to Sum-EE, we propose an iterative strategy to fathom the Karush– Kuhn–Tucker (KKT) states of the relating non-raised issue. For all figur es of legitimacy, we determine calculations to process a universally ideal arrangement in the asymptotic clamor restricted administration.

• Numerical comes about show that the advancement of the considered figures of legitimacy gives comparative execution for low estimations of the greatest transmit control; for this situation, augmenting the system vitality productivity is likewise approximatively identical to expanding the system ghastly proficiency. For extensive estimations of the most extreme transmit control, a direct diminishment of the system phantom effectiveness may permit a huge vitality sparing; in this administration, Sum-EE and Prod-EE permit to more readily control the individual vitality productivity accomplished by every BS than GEE, which is an appealing component in heterogeneous systems. Additionally, Prod-EE guarantees a more adjusted utilization of the accessible subcarriers at the cost of a more extreme misfortune regarding system ghostly proficiency.

2. SYSTEM DESCRIPTION

We consider a cluster ofM coordinated BSs in the downlink of an OFDMA network employing N subcarriers and universal frequency reuse. Users and BSs are equipped with one receive and one transmit antenna, respectively. Each user is connected to only one BS, which is selected based on long-term channel quality measurements. We denote by Bm the (non-empty) set of users assigned to BS m and assume that each BS serves at most one user at a time on each subcarrier. We consider an infinitely backlogged traffic model wherein each access point always has data available for transmission to all connected users. Also, e assume that the channels remain constant during each transmission frame, and that each user can accurately estimate the channels from the coordinated BSs to itself and feedback them to its serving BS.

A. Signal model

Assuming perfect synchronization, the discrete-time baseband signal received by user s 2 Bm on subcarrier n is

$$y_s^{[n]} = \underbrace{H_{m,s}^{[n]} x_m^{[n]}}_{\text{in-cell data}} + \underbrace{\sum_{\ell=1,\ell\neq m}^{M} H_{\ell,s}^{[n]} x_\ell^{[n]}}_{\text{out-of-cell data}} + \underbrace{n_s^{[n]}}_{\text{noise}} . \qquad (1)$$

In (1), $H^{[n]}_{q,s}$ is the complex channel response between BS q and user s on subcarrier n, which includes small scale fading, large scale fading and path attenuation [1], while $x^{[n]}{}_{q}$ is the complex symbol transmitted by BS q on subcarrier n. The transmitted symbols are modeled as independent random variables with zero mean and variance $E\{x^{[n]}{}_{m}2\} = p^{[n]}{}_{m} \geq 0$ Finally, $n^{[n]}{}_{s}$ is the additive noise received by user s, which ismodeled as a circularly-symmetric, Gaussian random variable

 @ 2013-2018 http://www.ijitr.com All rights Reserved.

with variance $N^{[n]}_s$ /2 per real dimension. Different noise levelsat each mobile account for different levels of the out-of-cluster interference and for different noise figures of the receivers.The signal-to-interference-plus-noise ratio (SINR) for BS mon subcarrier n when serving user s € B_m is

$$\mathrm{SINR}^{[n]}_{m,s} = \frac{p^{[n]}_m G^{[n]}_{m,s}}{1 + \sum_{\ell=1,\ell\neq m}^{M} p^{[n]}_\ell G^{[n]}_{\ell,s}} \qquad (2)$$

$G^{[n]}_{q,s} = |H^{[n]}_{q,s}|^2/\mathcal{N}^{[n]}_s$; also, the corresponding achievable information rate (in bit/s) is [36]

$$\mathrm{R}^{[n]}_{m,s} = B \log_2 \left[1 + \mathrm{SINR}^{[n]}_{m,s}\right] \qquad (3)$$

B. Power model

Following [17], [28], [29], the consumed power is modeled as the sum of two terms, accounting for the power dissipated in the amplifier and in the RF transmit circuits, respectively. The power dissipated in the amplifier is expressed as p, with p _ 0 and _ 1 being the transmit power output by the amplifier and a scaling coefficient which accounts for the amplifier and feeder losses. Instead, the power dissipated in the remaining circuit blocks is modeled as a constant term _ > 0, which accounts for battery backup and for signal processing carried out in the mixer, frequency synthesizer, active filters, and digital-to-analog converter. Both _ and generally scale with the additional losses incurred by the power supply and/or the cooling equipment. Accordingly, the power consumed by BS m on subcarrier n is written as

$$P^{[n]}_{c,m} = \theta^{[n]}_m + \gamma^{[n]}_m p^{[n]}_m \,. \qquad (4)$$

C. Energy-efficient resource allocation

Let k(m; n) 2 Bm indicate the user scheduled by BS m on subcarrier n and define $k^{[n]}$ = (k(1; n); : : : ; k(M; n))T and k = vecfk[1] : : : ; k[N]g. Also, we define p[n] = (p[n] $_1$; : : : ; p[n] $_M$)T and p = vecfp[1]; : : : ; p[N]g. System optimization requires selecting k and p so to maximize a meaningful figure of merit under some physical constraint. In this work, we aim at maximizing the network energy efficiency. We consider three figures of merit, which encapsulate different aspects related to the energy efficiency of the considered coordinated cluster. The first one is the global energy efficiency, defined as the ratio between the network sum-rate and the network power consumption, i.e,

$$\mathrm{GEE}(\mathbf{p},\mathbf{k}) = \frac{\sum_{m=1}^{M}\sum_{n=1}^{N} \mathrm{R}^{[n]}_{m,k(m,n)}}{\sum_{m=1}^{M}\sum_{n=1}^{N}\left(\theta^{[n]}_m + \gamma^{[n]}_m p^{[n]}_m\right)}. \qquad (5)$$

Another meaningful figure of merit is the weighted sum of the energy efficiencies across all subcarriers and BSs, i.e.,

$$\text{Sum-EE}(\mathbf{p},\mathbf{k}) = \sum_{m=1}^{M}\sum_{n=1}^{N} w^{[n]}_{m,k(m,n)} \frac{\mathrm{R}^{[n]}_{m,k(m,n)}}{\theta^{[n]}_m + \gamma^{[n]}_m p^{[n]}_m} \qquad (6)$$

where the weight w[n] m;s, for m = 1; : : : ;M, n = 1; : : : ;N and s 2 Bm, may account for the priority of the scheduled users, the nature of the coordinated BSs, and the services assigned to each subcarrier. Differently from GEE, this figure of merit is well suited for heterogenous networks, as the weights can now be used to control the energy efficiency achieved on a specific subcarrier or BS. If we choose w[n] m;s = 1 MN , then Sum-EE is the arithmetic mean of the energy efficiencies across all subcarriers and BSs. Finally, we consider the exponentially-weighted product of the energy efficiencies across all subcarriers and BSs, i.e.,

$$\text{Prod-EE}(\mathbf{p},\mathbf{k}) = \prod_{m=1}^{M}\prod_{n=1}^{N}\left(\frac{\mathrm{R}^{[n]}_{m,k(m,n)}}{\theta^{[n]}_m + \gamma^{[n]}_m p^{[n]}_m}\right)^{w^{[n]}_{m,k(m,n)}} . \qquad (7)$$

Due to its multiplicative nature, maximization of (7) leads to a configuration where all subcarriers are always used for transmission by all BSs, which may not be the case when GEE or Sum-EE are considered. Therefore, maximizing Prod- EE leads to a more balanced power allocation on the different subcarriers, allowing a simpler design of the transmit amplifiers. Prod-EE also grants the possibility to tune the energy efficiency of each subcarrier through the choice of the weights. For w[n] m;s = 1 MN , Prod-EE is the geometric mean of the energy efficiencies across all subcarriers and BSs.

In the following, we present algorithms aimed at maximizing the above figures of merit under per-BS or per-subcarrier power constraints. In keeping with a common trend in the open literature, we assume perfect channel state information and optimize the GEE, Sum-EE, and Prod-EE based on instantaneous channels. An alternative approach, that is however out of the scope of this work, is to perform resource allocation based on long-term variations of the channel [37], [38].

The proposed algorithms require to run in a centralized controller, which collects the channel measurements from the coordinated BSs and outputs the scheduling and the transmit power for each BS and subcarrier. This complexity overhead is expected to be affordable with the currently available technology. Indeed, with the advent of the software defined networking paradigm and of the cloud radio access network architecture, cellular systems will be made of light BSs performing only baseband to radio frequency conversion, while neighboring BSs will be connected via high-capacity links to a central unit performing most of the data processing [39], [40]. Clearly, our methods well fit in this context.2 Also, BS coordination is usually required only for mobile users that are at the edge of the cells, i.e., midway among two or

 @ 2013-2018 http://www.ijitr.com All rights Reserved.

more BSs; as a consequence, the number of mobile terminals involved may be only a small fraction of the overall set of active users.

3. NUMERICAL RESULTS

In this section, we study the system performance via Monte-Carlo simulations. We consider the wireless cellular network

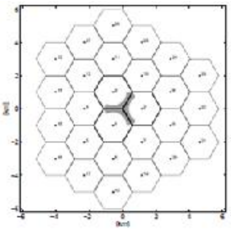

Figure 1. Simulated cellular network. BSs 1, 2, and 3 are coordinated, and users are randomly dropped in the grey area.

in Figure 1. BSs 1, 2, and 3 coordinate their transmission (hence, M = 3) on N = 16 subcarriers with bandwidth B = 180 kHz. Each BS serves three users, i.e., jBmj = 3, which are uniformly distributed in the grey area. As to the power model, _[n] 1 = 0:25 W, _[n] 2 = 0:5 W, _[n] 3 = 0:75 W, and [n] 1 = [n] 2 = [n] 3 = 3:8, for n = 1; : : : ; 16, which are typical values for LTE systems [17]. On each subcarrier, we consider Rayleigh fading, Log-Normal shadowing with standard deviation 8 dB, and the path-loss model PL(d) = PL0 (d0=d)4, where d _ d0 is the distance in meters, and PL0 is the freespace attenuation at the reference distance d0 = 100 m with a carrier frequency of 1800 MHz [1].

Following [49], the noise variance N[n] s (which accounts for the power of both the thermal noise and the out-of-cluster interference) is modeled as

$$\mathcal{N}_s^{[n]} = \underbrace{FN_0B}_{\text{thermal noise}} + \underbrace{P_{\text{out}}\text{PL}_0 \sum_{j\in\mathcal{I}} \left(\frac{d_0}{d_{j,s}}\right)^4 \xi_{j,s}^{[n]}}_{\text{out-of-cluster interference}}$$

where F = 3 dB is the noise figure of the receiver, N0 = 174 dBm/Hz is the power spectral density of the thermal noise, I = f4; 5; : : : ; 27g is the set of uncoordinated BSs in Figure 1, Pout is the average power radiated by the uncoordinated BSs on each subcarrier, dj;s is the distance from BS j to user s, and _[n] j;s is the Log-Normal shadowing (we assume that users only track long-term interference levels from uncoordinated BSs and, hence, short-term fading is averaged out). Notice that Pout = 0 corresponds to the case in which the cluster of coordinated BSs is isolated.

The following analysis refers to a per-subcarrier power constraint with P[n] m;max = Pmax=N; a per-BS power constraint showed in our experiments a similar behavior and, hence, is not illustrated for brevity. Unless otherwise stated, the weights

A. Implementation of the proposed algorithms

All algorithms are initialized by assuming that the BSs transmit at the maximum power on each subcarrier. Moreover, letting f` be the value of the objective function at iteration `. The loop is stopped if /f`e-f`e-1/=fe-1 < 10^{-4} or a maximum number of 50 iterations has been reached.

The resource allocation strategies maximizing GEE, Sum- EE, and Prod-EE are referred to as GEE-opt, Sum-EE-opt, and Prod-EE-opt, respectively. For the sake of comparison, we also show the performance obtained by transmitting at the maximum power and by the resource allocation strategy in [8] maximizing the network sum-rate, i.e., the numerator of GEE in (5), which is referred to as sum-rate-opt.

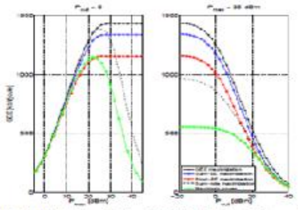

Figure 2. GEE vs P_{max} for P_{out} = 0 (left); GEE vs P_{out} for P_{max} = 35 dBm (right).

$w^{[n]}_{m,k(m,n)}$ in (6) and (7) are set to $1/(MN)$. Finally, all plots are obtained after averaging over 1000 independent user drops.

B. Performance results

Figures 2–6 show GEE, Sum-EE, Prod-EE, sum-rate, and the power radiated by each BS, respectively, for all considered resource allocations. In each figure, the subplot on the left refers to an isolated cluster, and the results are shown versus Pmax; the subplot on the right refers to a non-isolated cluster, and the results are shown versus Pout for Pmax = 35 dBm. For an isolated cluster, all solutions provide similar performance when Pmax _ 10 dBm, since the radiated power consumption is negligible with respect to the static power consumption and, also, the cochannel interference is small compared to the noise power. For larger values of Pmax, instead, the considered figures of merit lead to different resource allocation strategies and, consequently, system performance. In this regime, the sum-rate-opt solution increases the network sum-rate at the price of a heavy degradation in the system energy efficiency

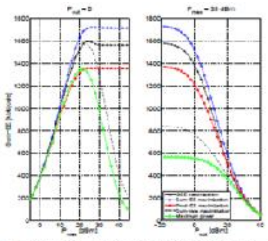

Figure 3. Sum-EE vs P_{max} for P_{out} = 0 (left); Sum-EE vs P_{out} for P_{max} = 35 dBm (right).

 @ 2013-2018 http://www.ijitr.com All rights Reserved.

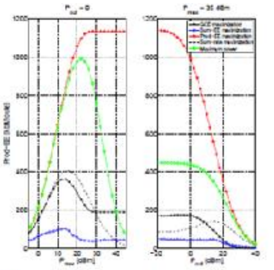

Figure 4. Prod-EE vs P_{max} for $P_{out} = 0$ (left); Prod-EE vs P_{out} for P_{max} = 35 dBm (right).

no matter which definition of energy efficiency is considered (GEE, Sum-EE, or Prod-EE). On the other hand, the GEEopt, Sum-EE-opt, and Prod-EE-opt solutions exhibit a floor as Pmax increases, since they do not use the excess available power to further increase the rate, as shown by Figure 6. For a non-isolated cluster, the value of GEE, Sum-EE, Prod- EE, and sum-rate degrade for increasing values of the out-ofcluster interference, irrespectively of the considered optimization criterion. Also, the performance gap among the considered solutions reduces as Pout increases, since the out-of-cluster interference becomes dominant, making coordinated resource allocation less and less beneficial. It is interesting to notice that, in order to counteract the increased interference level, GEE-opt, Sum-EE-opt, and Prod-EE-opt solutions progressively use a larger fraction of the available power.

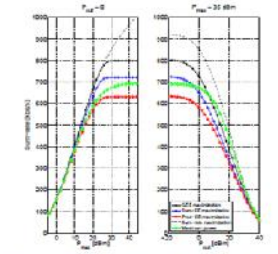

Figure 5. Sum-rate vs P_{max} for $P_{out} = 0$ (left), sum-rate vs P_{out} for P_{max} = 35 dBm (right).

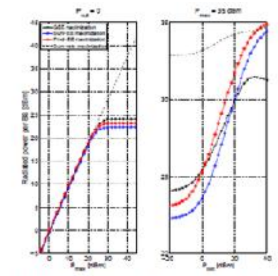

Figure 6. Per-BS radiated power vs P_{max} for $P_{out} = 0$ (left); per-BS radiated power vs P_{out} for P_{max} = 35 dBm (right).

Figure 7 shows the empirical CDF of the energy efficiency achieved on each subcarrier for Pmax = 20 dBm (top) and the standard deviation of the energy efficiency achieved on each subcarrier versus Pmax (bottom), for the GEE-opt, Sum-EE-opt, and Prod-EE-opt solutions; an isolated cluster is considered. Results show that the energy efficiency achieved on the individual subcarriers is less dispersed for the Prod-EE-opt allocation, thus confirming that Prod-EE maximization provides a more balanced use of the available subcarriers. Finally, we study the convergence of the proposed algorithms. Figure 8 reports the value of GEE, Sum-EE, and Prod- EE versus the number i of iterations of Algorithms 1, 5, and 6, respectively. The upper plots refer to an isolated cluster, while the lower plots to a non-isolated cluster. All algorithms reach a steady value in few iterations in all considered scenarios; also, the convergence speed decreases for increasing values of Pmax and for diminishing values of Pout, i.e., when the system performance is limited by the co-channel interferencegenerated by the other coordinated BSs.

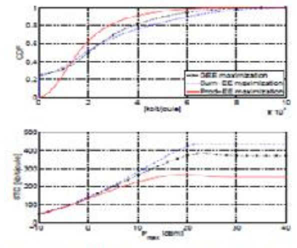

Figure 7. Empirical CDF of the energy efficiency achieved on each subcarrier when P_{max} = 20 dBm and $P_{out} = 0$ (top); standard deviation of the energy efficiency achieved on each subcarrier versus P_{max} when $P_{out} = 0$ (bottom).

C. Influence of the weights

The weights in the definition of Sum-EE and Prod-EE may be used to give priority to specific subcarriers and/or BSs; this is an attractive feature, especially in heterogeneous scenarios. As an example, we consider the maximization of Sum-EE with two choices of the weights: a) w[n] 1;s = 0:7, w[n] 2;s = 0:5, and w[n] 3;s = 0:3; b) w[n] 1;s = 0:3, w[n] 2;s = 0:5, and w[n] 3;s = 0:7. In Figure 9, we consider the Sum-EE-opt solution and report the average energy efficiency of each coordinated BS, i.e.,

$$\frac{1}{N}\sum_{n=1}^{N}\frac{R_{m,k(m,n)}^{[n]}}{\gamma_m^{[n]}p_m^{[n]}+\theta_m^{[n]}}$$

for m = 1; : : : ;M. An isolated cluster is considered, and the results are plotted versus Pmax. Since _[n] 1 = 0:25, _[n] 2 = 0:5, and _[n] 3 = 0:75, BS1 is the most energy-efficient BS, while BS3 is the most energy-inefficient BS. In the first scenario, BS1 achieves an average energy-efficiency much larger than that of other BSs, as it has the largest priority and the best energy efficiency. Instead, BS3 is extremely penalized, as it has the worst energy efficiency and the smallest priority. In the second scenario, a more balanced resource allocation is obtained by assigning a higher priority to BS3 and a lower priority to BS1. Notice that the performance of BS2 remains approximatively unchanged, as its weights are kept fixed.

 @ 2013-2018 http://www.ijitr.com All rights Reserved.

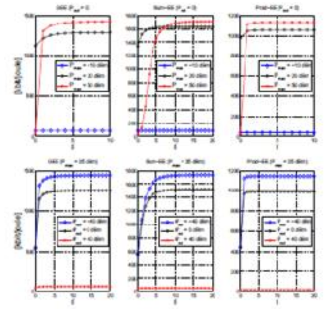

Figure 8. GEE, Sum-EE, and Prod-EE versus the number i of iterations of Algorithms 1, 5, and 6, respectively. Top: $P_{max} = -10, 20, 50$ dBm and $P_{ckt} = 0$. Bottom: $P_{ckt} = -40, 0, 40$ dBm and $P_{max} = 35$ dBm.

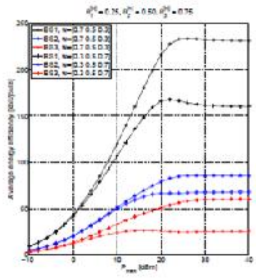

Figure 9. Average energy efficiency of each coordinated BS versus P_{max}. The Sum-EE-opt solution and an isolated cluster are considered.

D. Impact of the number of subcarriers and users.

Experiments have been carried out to also study the impact of the number of subcarriers and users on the system performance; we offer here some general comments on the results, without including any detailed plot for the sake of brevity. If the maximum transmit power scales linearly with N, the system performance are only marginally affected by the number of subcarriers. To be more specific, let us first focus on GEE. When N scales up, the system sum-rate proportionally increases, as more subcarriers are available for transmission and the average transmit power per-subcarrier remains fixed. At the same time, the power consumption is also increased, and the ratio between the sum-rate and sum-power remains substantially unchanged. Similarly, the energy efficiency of each individual subcarrier remains approximatively constant, and, consequently, the arithmetic and geometric means of the energy efficiencies across all subcarriers do not scale with N.

In keeping with intuition, if the number of users in the coordinated cluster is increased, the system performance tends to improve due to the multiuser diversity gain [1]. Clearly, while the network-wide performance improves, the average physical resources assigned to each user progressively reduce.

E. Discussion on algorithms' complexity

As seen from Figure 8, the proposed algorithms converge in only 5 - 15 iterations, depending on the operating scenario. For each method, the complexity of a single iteration is mainly tied to the optimization of the transmit power.

In Algorithm 1, the power update requires the solution of the fractional program (13). Several equivalent methods exist to tackle fractional problems [29], and Algorithm 1 is independent of the employed method. Here, we have resorted to Dinkelbach's algorithm, which is widely-used in the literature. The Dinkelbach's algorithm has a super-linear convergence rate [29] and, in each iteration, only requires the solution of a convex problem, which can be accomplished in polynomial time by means of many convex programming algorithms [44]. In Algorithm 5, the power update just requires the computation of the algebraic expressions in (28) and the solution to the waterfilling-like problems in (29), which can be accomplished in logarithmic time through a bisection search. Finally, the power update in Algorithm 6 requires the solution of a convex problem, which again is accomplished in polynomial time.

4. CONCLUSIONS

We have studied the problem of resource allocation in the downlink of an OFDMA network with base station coordination. Three figures of merit have been considered for system design, namely, the ratio of the network sum-rate to the network power consumption (GEE), the weighted sum of the energy efficiencies on each subcarrier (Sum-EE), and the exponentially-weighted product of the energy efficiencies on each subcarrier (Prod-EE). Algorithms for coordinated user scheduling and power allocation have been proposed, under a per-BS or per-subcarrier power constraint. In particular, GEE is optimized by solving a series of concave-convex Complexity generally grows with the number of coordinated BSs and active users. However, the number of coordinated BSs is usually in the order of few units, since the advantages of cooperation with far-away BSs are marginal. Moreover, coordination may only be performed for cell-edge users, which typically do not experience favorable propagation conditions. fractional relaxations, while for Prod-EE a series of concave relaxations is considered; as to Sum-EE, an iterative method to solve the Karush–Kuhn–Tucker conditions is proposed. For all figures of merit, algorithms to compute a globally-optimal solution are derived in the asymptotic noise-limited regime. It has been shown that Sum-EE and Prod-EE provide more degrees of freedom for system design compared to the more popular GEE, as the corresponding weights may be used to give priority to specific subcarriers and/or base stations. Also, Prod-EE inherently makes a more balanced use of the available spectrum, preventing the unpleasant situation where few subcarriers receive most of the system resources.

 @ 2013-2018 http://www.ijitr.com All rights Reserved.

(IJITR) INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND RESEARCH
Volume No.6, Issue No.4, June - July 2018, 8421-8427.

5.REFERENCES

[1] A. Goldmith, Wireless Communications. Cambridge University Press,2005.

[2] S. Das, H. Viswanathan, and G. Rittenhouse, “Dynamic load balancing through coordinated scheduling in packet data systems,” in Proc. 2003 IEEE INFOCOM, San Francisco, CA, Mar. 2003, pp. 786–796.

[3] L. Venturino, N. Prasad, and X. Wang, “An improved iterative waterfilling algorithm for multi-cell interference mitigation in downlink OFDMA networks,” in Proc. Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, Nov. 2007, pp. 1718–1722.

[4] D. Gesbert, S. G. Kiani, A. Gjendemsjø, and G. E. Øien, “Adaptation, coordination, and distributed resource allocation in interference-limited wireless networks,” Proceedings of the IEEE, vol. 95, no. 12, pp. 2393–2409, Dec. 2007.

[5] S. G. Kiani and D. Gesbert, “Optimal and distributed schedulingfor multicell capacity maximization,” IEEE Transactions on Wireless Communications, vol. 7, no. 1, pp. 288–297, Jan. 2008.

[6] L. Venturino, N. Prasad, and X. Wang, “A successive convex approximation algorithm for weighted sum-rate maximization in downlink OFDMA networks,” in Proc. 2008 IEEE Conference on Information Sciences and Systems, Princeton, NJ, Mar. 2008, pp. 379–384.

[7] A. Gjendemsj, D. Gesbert, G. Oien, and S. Kiani, “Binary power control for sum rate maximization over multiple interfering links,” IEEE Transactions on Wireless Communications, vol. 8, no. 7, pp. 3164–3173, Aug. 2008.

[8] L. Venturino, N. Prasad, and X. Wang, “Coordinated scheduling and power allocation in downlink multicell OFDMA networks,” IEEE Transactions on Vehicular Technology, vol. 58, no. 6, pp. 2835–2848, Jul. 2009.

[9] H. Zhang, L. Venturino, N. Prasad, P. Li, S. Rangarajan, and X. Wang, “Weighted sum-rate maximization in multi-cell networks via coordinated scheduling and discrete power control,” IEEE Journal on Selected Areas in Communications, vol. 29, no. 6, pp. 1214–1224, Jun. 2011.

[10] P. C. Weeraddana, M. Codreanu, M. Latva-aho, A. Ephremides, and C. Fischione, Weighted sum-rate maximization in wireless networks: A review. Foundations and Trends in Networking, 2012.

[11] F. R. Yu, X. Zhang, and V. C. Leung, Green Communications and Networking. CRC Press, 2012.

[12] “FP7 European Project INFSO-ICT-247733 EARTH (Energy Aware Radio and Network Technologies),” https://www.ict-earth.eu/, 2010.

[13] “Special issue on energy-efficient wireless communications,” IEEE Journal on Selected Areas in Communications, vol. 29, no. 8, Sep. 2011.

[14] “Special issue on energy efficiency in communications,” IEEE Communications Magazine, vol. 48, no. 11, Nov. 2010.

[15] A. Fehske, G. Fettweis, J. Malmodin, and G. Biczok, “The global footprint of mobile communications: The ecological and economic perspective,” IEEE Communications Magazine, vol. 49, no. 8, pp. 55–62, Aug. 2011.

[16] J. G. Andrews, S. Buzzi, W. Choi, S. Hanly, A. Lozano, A. C. Soong, and J. C. Zhang, “What will 5G be?” IEEE Journal on Selected Areas in Communications, Sep. 2014.

AUTHOR’s PROFILE

Konidena. Praveena, Pursuing M.Tech (VLSI&ESD) from SKR College of Engineering & Technology, Manubolu, SPSR Nellore.AP.

V.Nanuku Naik, M.tech, Assistant Professor in Deportment of ECE, SKR College of Engineering & Technology, Manubolu, SPSR Nellore.AP.

 @ 2013-2018 http://www.ijitr.com All rights Reserved.